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Manitoba

Bovine tuberculosis in elk (*Cervus elaphus manitobensis*) near Riding Mountain National Park, Manitoba, from 1992 to 2002

From 1991 to April 2003, outbreaks of bovine tuberculosis (TB caused by *Mycobacterium bovis*) have been found in 11 cattle herds surrounding Riding Mountain National Park (RMNP). Located in southwestern Manitoba, RMNP and the surrounding area are home to a free-ranging herd of 2500 to 4000 elk that have been implicated as being a wildlife reservoir of *M. bovis* infection. Indirect contact between cattle and elk that feed during the winter on the same large, round hay bales is presumed to be the most likely mode of transmission between the species (1).

Elk were first implicated in 1992, when a wild elk shot in the vicinity of an infected cattle farm was found to be harboring the disease. Since 1997, an expanded wildlife surveillance program has operated under a federal-provincial partnership of Parks Canada, the Canadian Food Inspection Agency, Manitoba Agriculture and Food, and Manitoba Conservation. Animals shot by hunters or found dead are examined for gross evidence of bovine TB and suspicious lesions are submitted for histological and cultural confirmation. Of the 3273 animals of various species examined between 1992 and 2002, 10 of 1463 elk, 1 of 1079 white-tailed deer, and none of 557 moose were confirmed to be *M. bovis*-positive by culture. Only 40 of these elk were found dead (mostly wolf or road kills), none of which were positive. The remainder, including all the positive animals, were submitted as hunter kills.

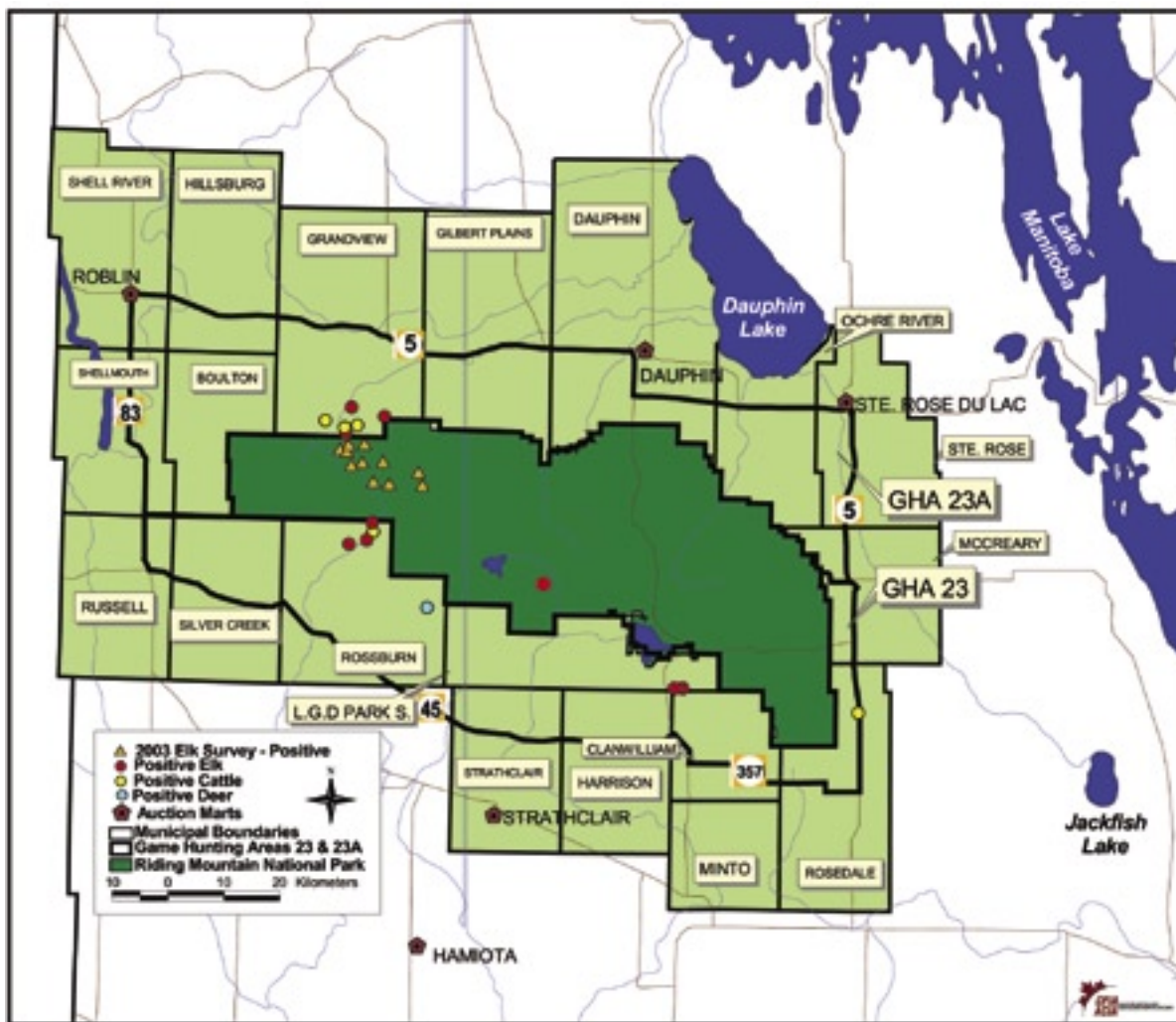


Figure 1. Riding Mountain National Park and surrounding area, Manitoba.

Table 1. Prevalence of TB in harvested elk

	Age group 1 (NS)	Age group 2 (NS)	Age group 3 ^a	Age group 4 (NS)
Females	2 of 386 (0.5%)	0 of 273	1 of 157 (0.6%)	1 of 44 (2.3%)
Males	0 of 192	2 of 234 (0.9%)	4 of 89 (4.5%)	0 of 14

^aOR = 7.3, *P* = 0.059
NS — not significant

An analysis of the epidemiology of TB in elk from 1992 to 2002 was conducted by using information contained in the wildlife surveillance database. Descriptive statistics were computed with a database and statistics program for public health professionals (Epi Info 2002, U.S. Department of Health and Human Services, Centers for Disease Control, Atlanta, Georgia, USA). The program computed odds ratios (as the cross-product of tables); since some cell values were < 5, Fisher's exact test was selected as the test of statistical significance. Box and whisker plots were also used to compare the age distributions by sex.

The age and sex distribution of all elk harvested in each rural municipality (RM) was examined to determine if there were any significant sampling discrepancies from one area to another (Figure 1). In classified aerial counts conducted within RMNP from 2000 to 2002, females represented 79% of the total number of adults identified (*n* = 1242). However, in the hunted population, males were significantly overrepresented (*P* < 0.0001), as only 62% of animals harvested were females, a pattern that was consistent ± 10% in all but 2 RMs (Boulton — 75% females, Clanwilliam — 44% females). The age of harvested animals was estimated based on dental examinations performed by RMNP biologists. Age group 1 animals (42%) were < 3 y of age, age group 2 (37%) were 3 to < 5 y, age group 3 (16%) were 5 to < 8 y, and age group 4 (4%) were ≥ 8 y. There was no statistically significant difference in the age distributions of males and females harvested overall. Furthermore, the age distributions of harvested animals in each RM were within ± 10% of the age group means. Therefore, although there was a consistent preference for harvesting males, no apparent predilections were observed for selecting animals of one age group over another, based on sex and geographic location.

The results of the distribution of TB cases are described in Table 1. Over all age groups, males were approximately 2.4 times more likely to be TB-positive than were females (*P* = 0.14). However, this was due primarily to the dramatic disparity in risk that occurred in age group 3, where males were 7.3 times more likely to be infected than females of the same age.

Analysis of the geographic distribution of cases revealed that the overall prevalence of TB-positive elk in 2 RMs on the west end of RMNP, Grandview and Rossburn, was 2.5% and 2.9%, respectively. In those 2 RMs, 3 of 14 (21%) males and 0 of 28 females in age group 3 were positive. A second focus was observed in LGD Park South, where the overall prevalence was 1%.

These results indicate that TB prevalence is very low in young animals of either sex, but by the time males

reach mature breeding age (5 to 8 y), they are 7 times more likely to be infected than females of the same age. This finding is consistent with studies of deer conducted in Michigan that found mature males to be 11.3 times more likely to be infected than young females and 4.6 times more likely to be infected than females of the same age (2). Mature bull elk may be at an increased risk for TB for several reasons. During the rut, breeding bulls lose body condition and may be in a weakened physiological and immunological state. Mycobacteria may also be spread more easily from bull to bull through close nose-to-nose snorting that occurs during sparring matches.

There appear to be 2 foci of infected animals, one near the west end of RMNP and another near the south, but whether or not these animals come into contact is not known at this time. To reduce the prevalence of bovine TB in elk, a number of risk management strategies are being considered, one of which may be the targeted removal of high risk animals, such as mature bulls in these locations.

Bovine TB in elk is a chronic, progressive disease for which laboratory confirmation is difficult. As such, these data probably underestimate the true prevalence of the disease. Given the low apparent prevalence and limited sample numbers in this study, statistical significance at the 95% level of confidence was approached, but not achieved. However, the trends observed appear to be in agreement with those found in a large study of bovine TB involving more than 62 500 white-tailed deer in Michigan. Further testing will be required to substantiate these findings for RMNP.

Acknowledgment

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References

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